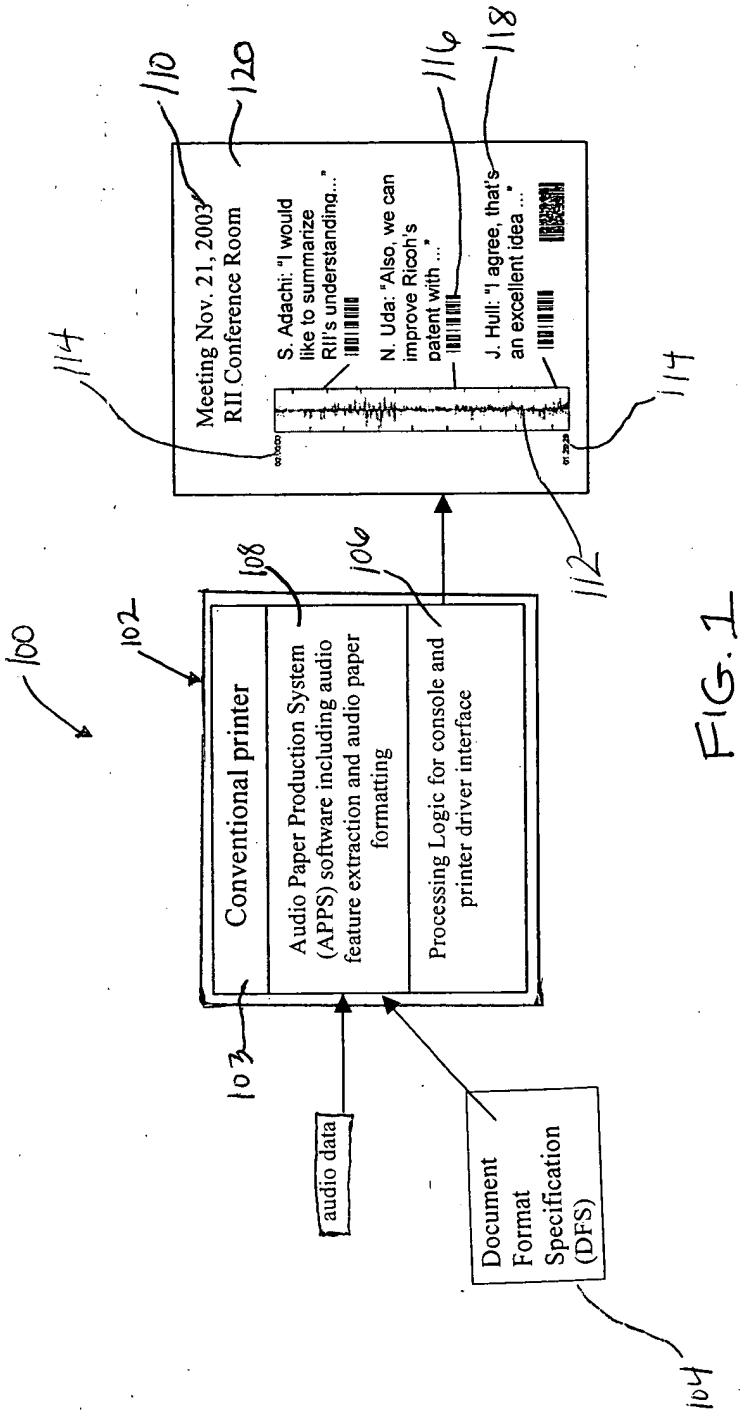

100
102
103
104
106
108
110
112
114
116
118
120
Conventional printer
Audio Paper Production System (APPS) software including audio feature extraction and audio paper formatting
Processing Logic for console and printer driver interface
audio data
Document Format Specification (DFS)
Meeting Nov. 21, 2003
RII Conference Room
S. Adachi: "I would like to summarize RII's understanding..."
N. Uda: "Also, we can improve Ricoh's patent with ..."
J. Hull: "I agree, that's an excellent idea ..."

FIG. 1

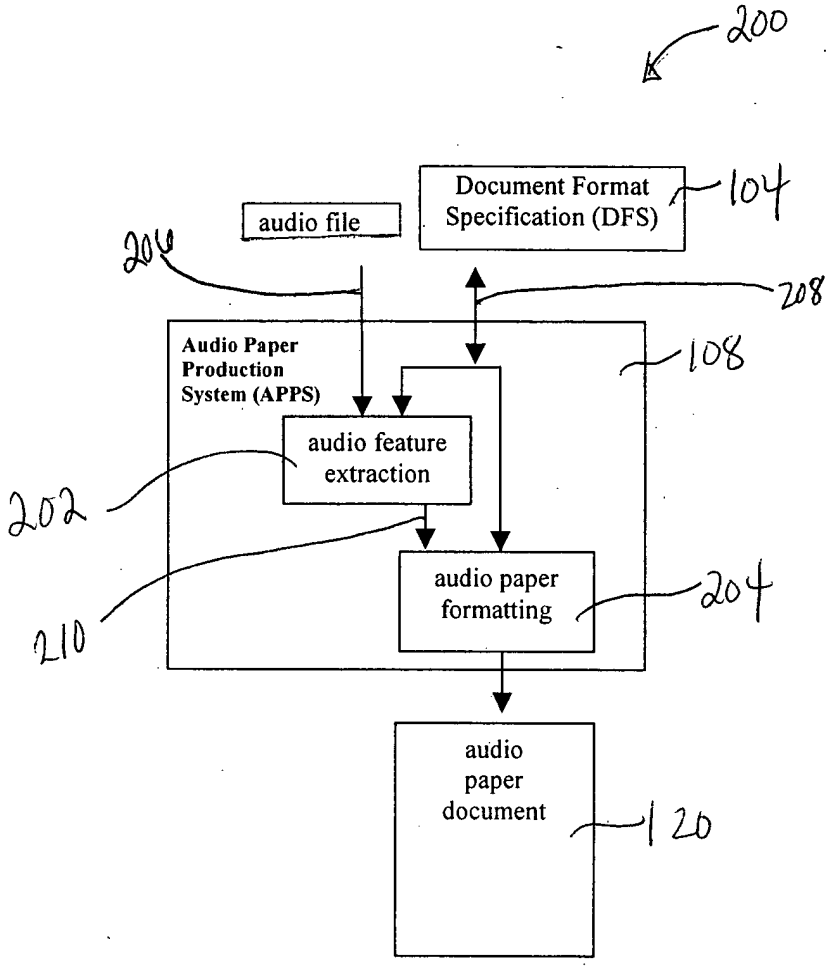

200
Document Format Specification (DFS)
104
audio file
206
208
Audio Paper Production System (APPS)
108
audio feature extraction
202
210
audio paper formatting
204
audio paper document
120

FIG. 2

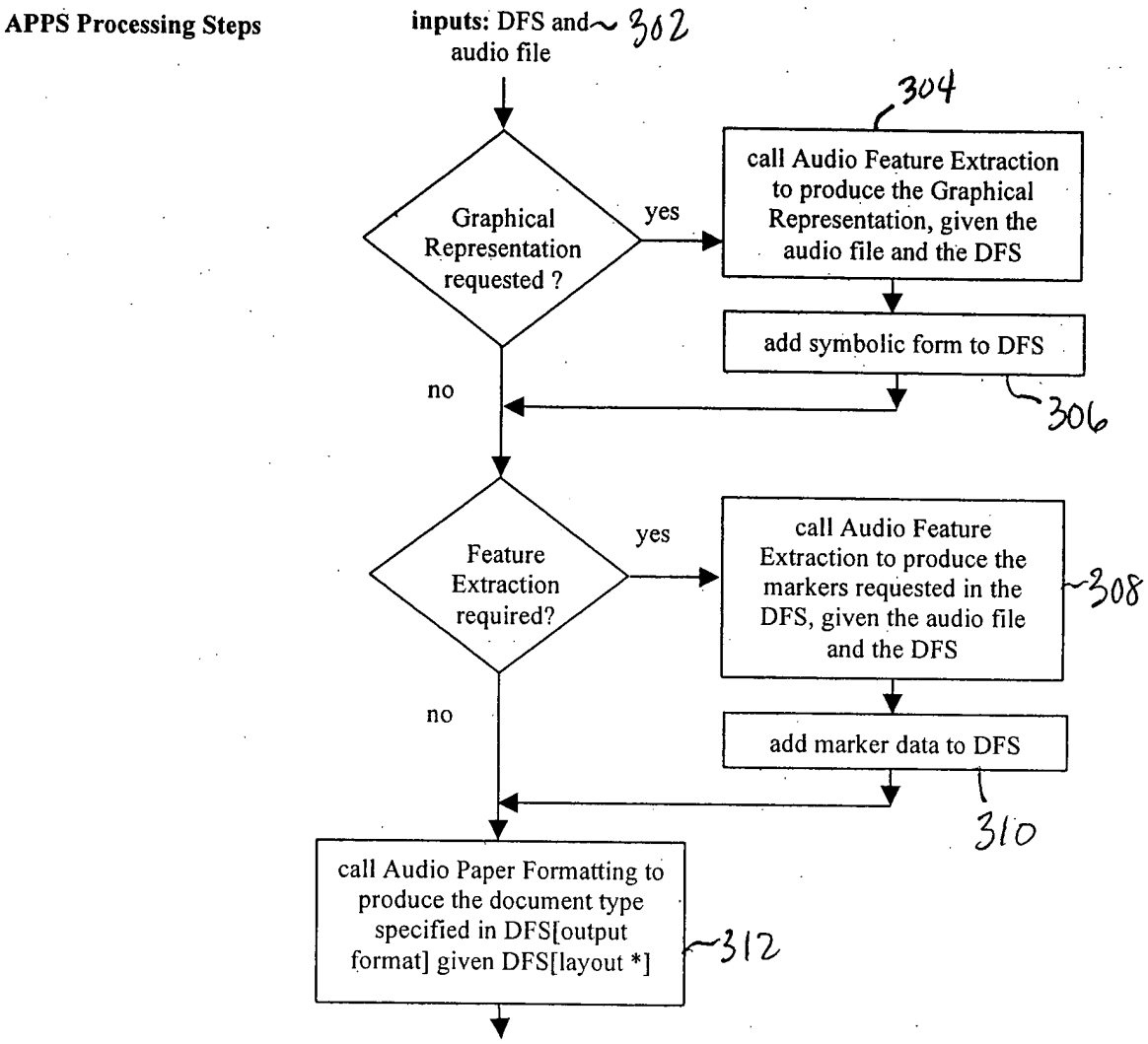

APPS Processing Steps
inputs: DFS and audio file
302
304
Graphical Representation requested ?
yes
call Audio Feature Extraction to produce the Graphical Representation, given the audio file and the DFS
add symbolic form to DFS
306
no
Feature Extraction required?
yes
call Audio Feature Extraction to produce the markers requested in the DFS, given the audio file and the DFS
308
add marker data to DFS
310
no
call Audio Paper Formatting to produce the document type specified in DFS[output format] given DFS[layout *]
312

FIG. 3

Audio Paper Formatting module

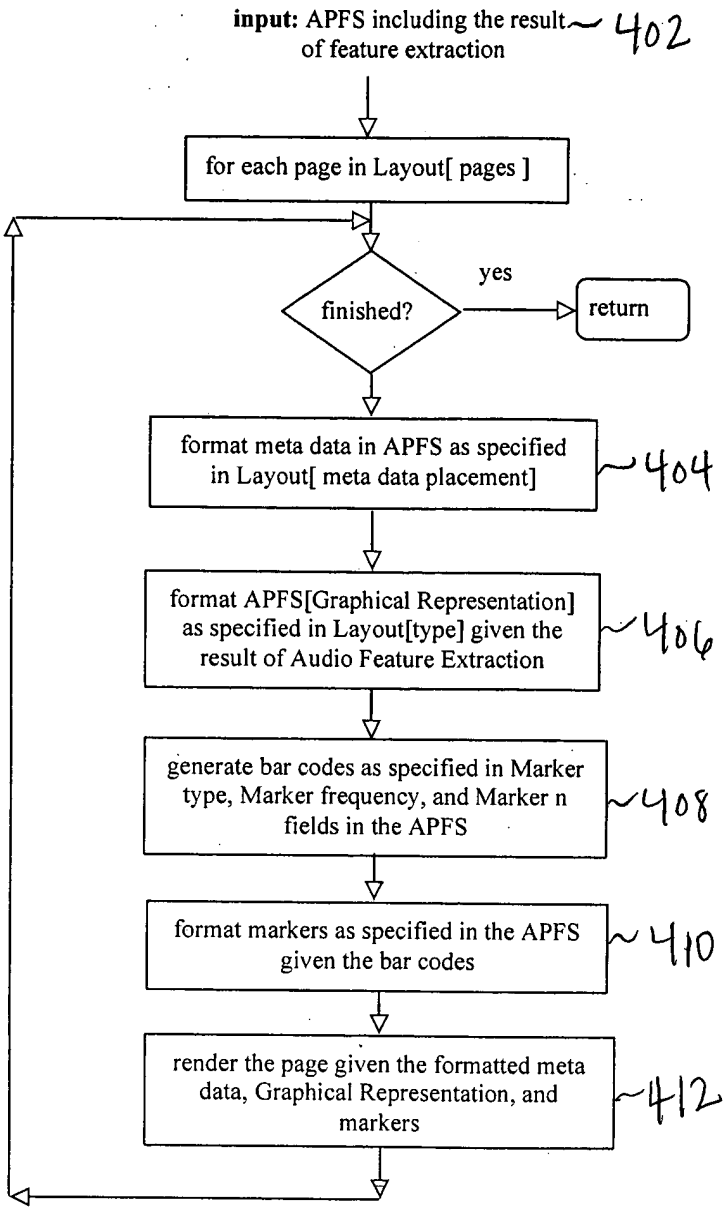


FIG. 4

Bar code generation

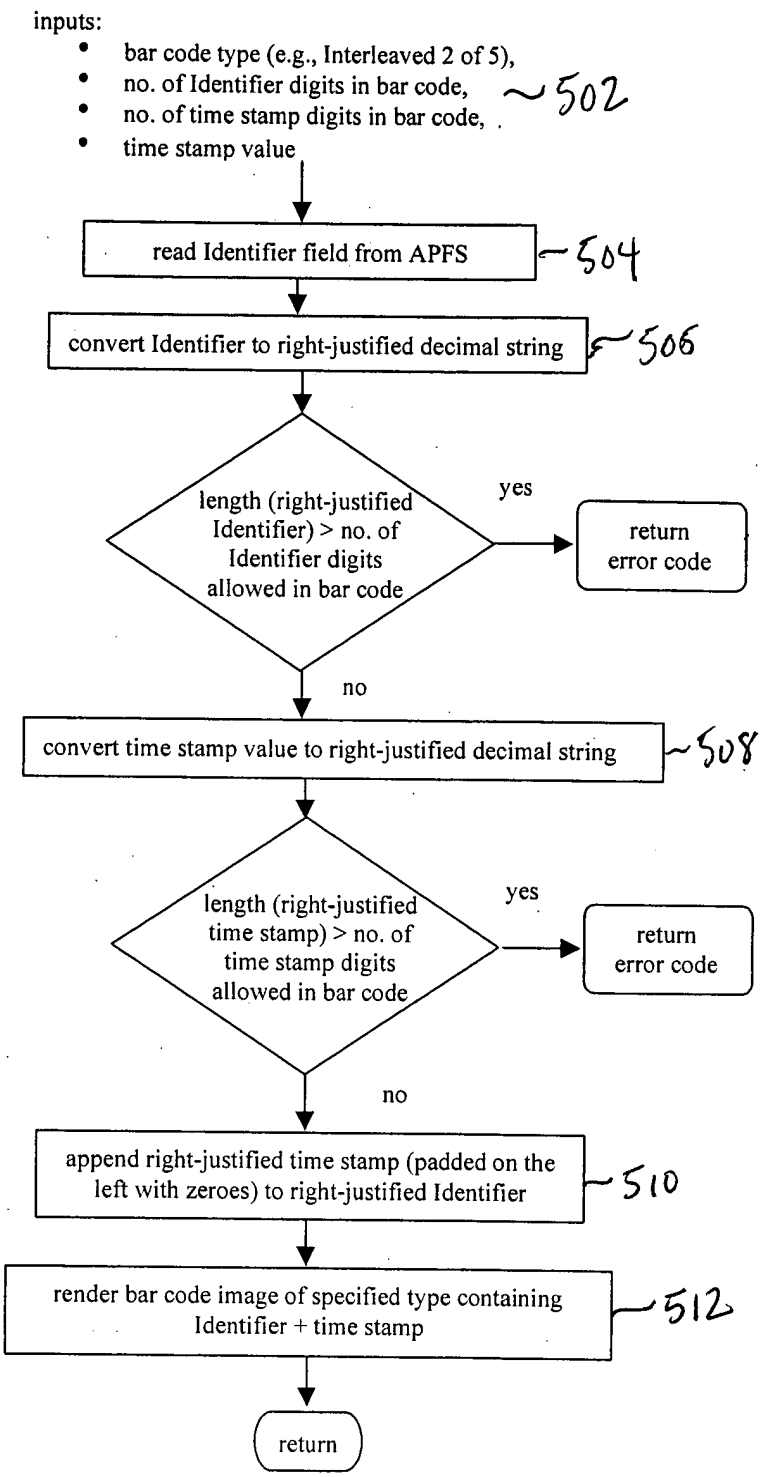


FIG. 5

104

Document Format Specification

Type = Musical recording (604)
Identifier = 1768 (608)
Title = Locomotion (610)
Artist = John Coltrane (612)
Collection = Blue Train (614)
Publisher = Blue Note Records (616)
Publication Date = 1957 (618)
Begin time = 00:00:00 (620)
End time = 00:07:14 (622)
Graphical Representation = Amplitude curve (624)
Marker type = bar code (628)
Marker frequency = 30 sec. intervals (630)
Layout type = One horizontal time line (632)
Layout pages = 1 (634)
Layout marker placement = Above graphical representation (636)
Layout meta data placement = Centered at top of page (638)

Audio Feature Extraction (602)

Audio amplitude extraction and graphical approximation. An svg file is output. (606)

FIG 6a

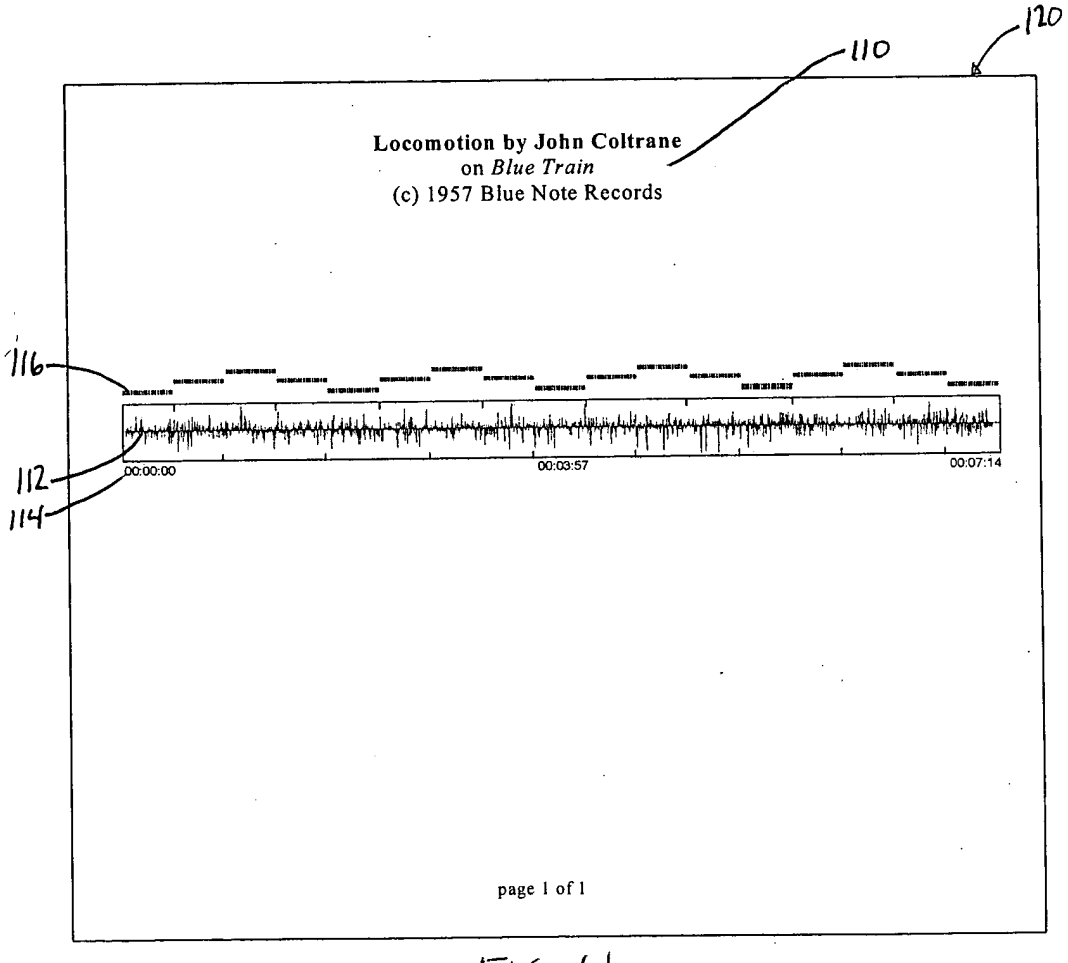


FIG 6b

104 → **Document Format Specification**

Type = Musical recording
Identifier = 1769
Title = Locomotion
Artist = John Coltrane
Collection = Blue Train
Publisher = Blue Note Records
Publication Date = 1957
Begin time = 00:00:00
End time = 00:07:14
Graphical Representation = Amplitude curve
Feature extraction = Musical solos (output is instrument name and time when solo began)
Marker type1 = Instrument name above bar code above time stamp
Marker type 2 = bar code
Marker2 frequency = 0, 50%, 100%
Layout type = One horizontal time line
Layout pages = 1
Layout marker1 placement = Above graphical representation
Layout marker 2 placement = Below time line
Layout meta data placement = Centered at top of page

Audio Feature Extraction ← 602

Audio amplitude extraction and graphical approximation. An svg file is output. Musical Solo extraction is also applied. It outputs the beginning times and instrument for each musical solo. ← 606

FIG. 7a

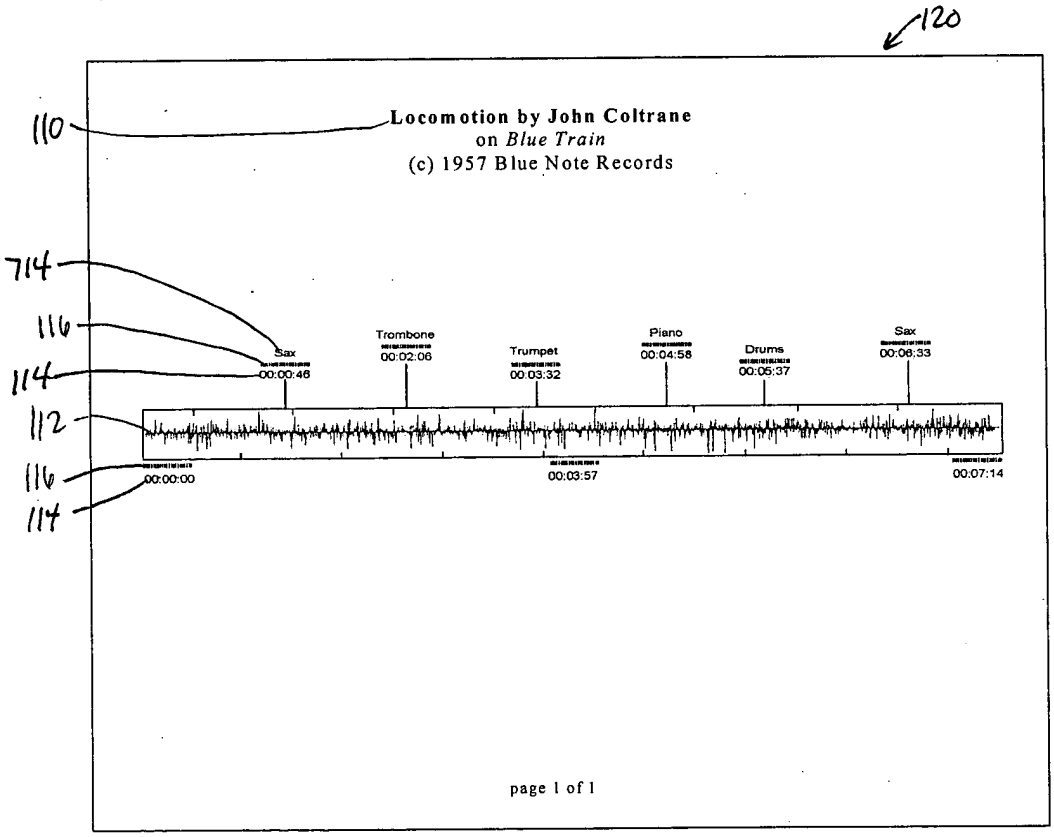


FIG. 7b

104

Document Format Specification

Type = Radio program
Identifier = 1770
Title = Fresh Air with host Terry Gross
802 annotation = Guest Bill O'Reilly
Publication Date = Oct. 8, 2003
Begin time = 00:00:00
End time = 00:40:45
Graphical Representation = Amplitude curve
Marker type = bar code
Marker frequency = regularly spaced
Layout type = One horizontal time line
Layout pages = 1
Layout marker placement = Above graphical representation, 3-step staircase
Layout meta data placement = Centered at top of page

602

Audio Feature Extraction

Audio amplitude extraction and graphical approximation. An svg file is output. 606

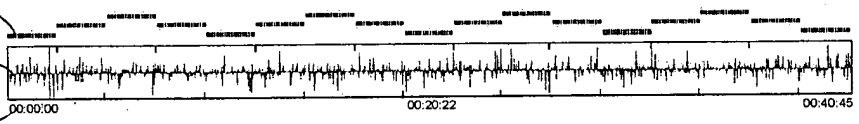
FIG 8a

120

110 **Fresh Air with Host Terry Gross**
Wed. Oct. 8, 2003
Guest Bill O'Reilly

116

112



114

page 1 of 1

FIG. 8b

604 → **Document Format Specification**

Audio Feature Extraction ← 602

Audio amplitude extraction and graphical approximation. An svg file is output.

Type = Radio program
Identifier = 1771
Title = Fresh Air with host Terry Gross
annotation = Guest Bill O'Reilly
Publication Date = Oct. 8, 2003
Begin time = 00:00:00
End time = 00:40:45
628 — Graphical Representation = Amplitude curve
Marker type = keywords, bar code, time stamp
630 — Marker placement = above time line
Marker frequency = user-defined
902 — Marker 1 = (WTC, bar code, 04:28, vert pos. 1)
Marker 2 = (NY Times, bar code, 09:08, vert. pos. 2)
Marker 3 = (Peabody, bar code, 12:30, vert. pos. 3)
...
Marker 11 = (People Mag, bar code, 39:10, vert. pos. 3)
Layout type = One horizontal time line
Layout pages = 1
Layout marker placement = Above graphical representation, as provided
Layout meta data placement = Centered at top of page

FIG. 9a

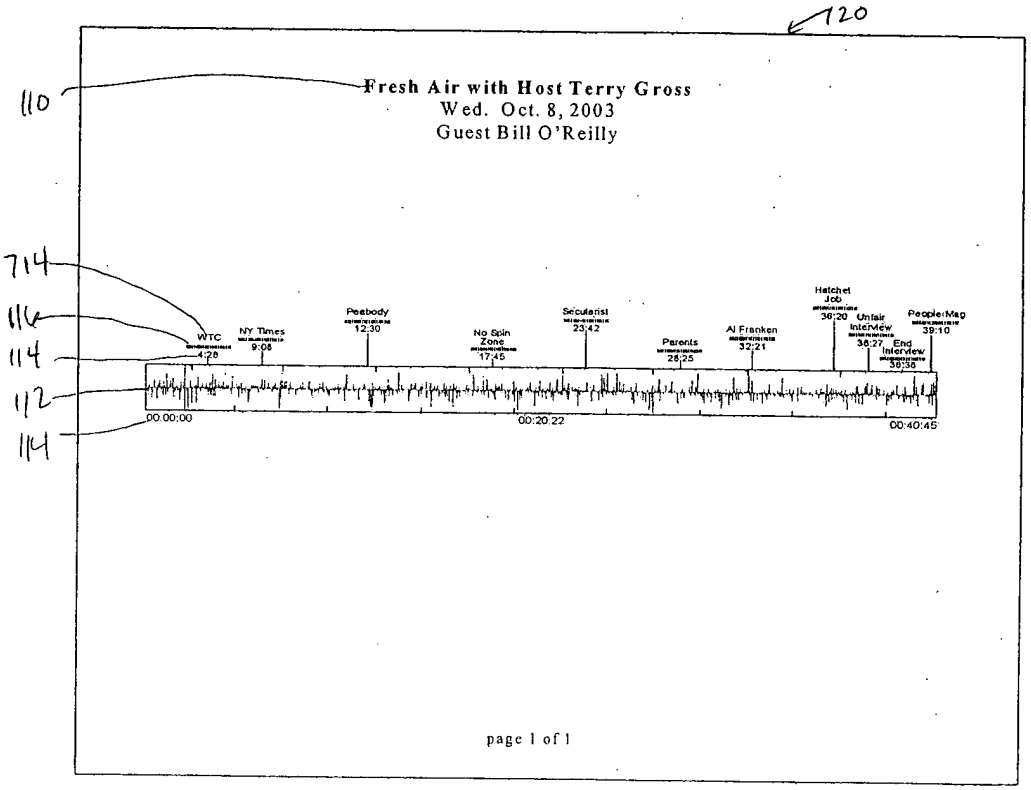


FIG. 9b

104 → **Document Format Specification**

Type = Radio program
Identifier = 1772

Title = Fresh Air with host Terry Gross
Annotation = Guest Bill O'Reilly
keyword search terms = "New York Times" and "fair and balanced"
Publication Date = Oct. 8, 2003
Begin time = 00:00:00
End time = 00:40:45
Graphical Representation = Amplitude curve
702 — Feature extraction = speech recognition and keyword match to "New York Times" or "fair and balanced"
628 — Marker type = matching search term, bar code, time stamp
Marker placement = above time line
Marker frequency = user-defined
630 — Marker 1 = ("fair and balanced", bar code, 02:31, vert pos. 2)
902 — Marker 2 = ("New York Times", bar code, 04:21, vert. pos. 1)
Marker 3 = ("New York Times", bar code, 14:54, vert. pos. 2)
...
Marker 9 = ("New York Times", bar code, 35:12, vert. pos. 3)
Layout type = One horizontal time line
Layout pages = 1
Layout marker placement = Above graphical representation, as provided
Layout meta data placement = Centered at top of page

Audio Feature Extraction ← 702

Audio amplitude extraction and graphical approximation. An svg file is output. Speech recognition is also applied followed by matching to a given list of phrases.

FIG. 10a.

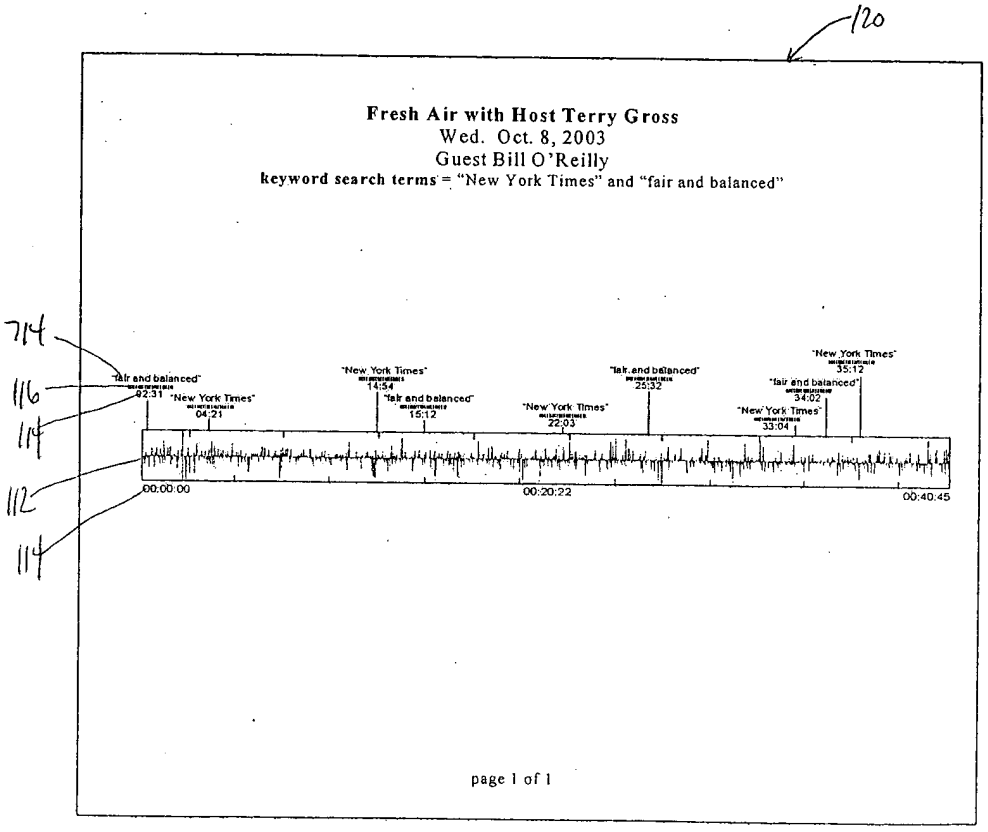


FIG 10b

104 **Document Format Specification**

Type = Radio program
Identifier = 1773

Title = A Prairie Home Companion
Annotation = applause events shown
Publication Date = Sun. Oct. 12, 2003
Begin time = 00:00:00
End time = 01:58:56
Graphical Representation = Amplitude curve
702 Feature extraction = applause detection alpha=0.27 beta=1.86
Marker type = time stamp, bar code
Marker placement = above time line
Marker frequency = user-defined
    Marker 1 = (00:02:13, bar code, pos. 1)
    Marker 2 = (00:10:54, bar code, pos. 2)
    Marker 3 = (00:12:32, bar code, pos. 3)
    ...
    Marker 16 = (01:56:01, bar code, pos. 2)
Layout type = One horizontal time line
Layout pages = 1
Layout marker placement = Above graphical representation, as provided
Layout meta data placement = Centered at top of page

Audio Feature Extraction 602

Audio amplitude extraction and graphical approximation. An svg file is output.
Applause detection outputs time stamps.

FIG. 11a.

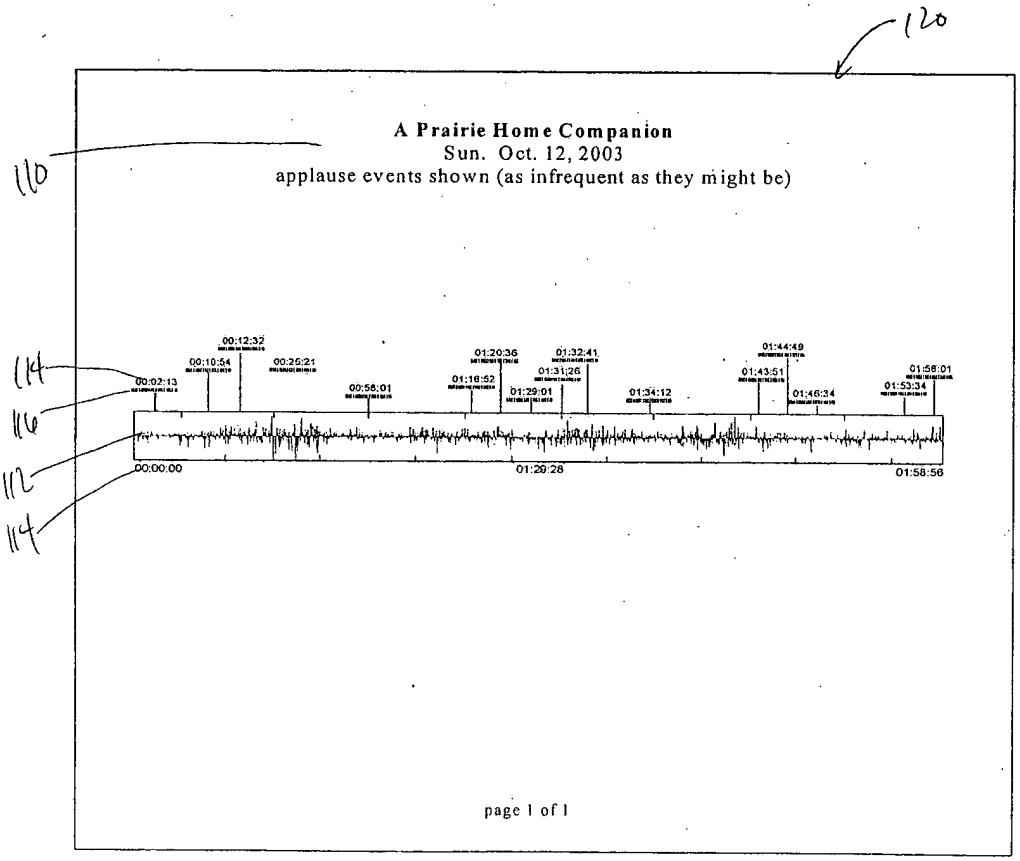


FIG. 11b

104

Document Format Specification

Type = Radio program
Identifier = 1774
Title = A Prairie Home Companion
Annotation = music events shown
Publication Date = Sun. Oct. 12, 2003
Begin time = 00:00:00
End time = 01:58:56
Graphical Representation = Amplitude curve
Feature extraction = music detection delta = 12.93
Marker type = time stamp, bar code
Marker placement = right of time line
Marker frequency = user-defined
Marker 1 = (00:21:54, bar code, horiz. pos. 1)
Marker 2 = (01:10:53, bar code, horiz. pos. 1)
Marker 3 = (01:34:01, bar code, horiz. pos. 1)
Marker 4 = (01:41:41, bar code, horiz. pos. 1)
Layout type = Two vertical time lines, split in half
Layout pages = 1
Layout marker placement = To right of graphical representation, as provided
Layout meta data placement = Centered at top of page

Audio Feature Extraction 602

Audio amplitude extraction and graphical approximation. An svg file is output.
Music detection outputs time stamps.

FIG. 12a

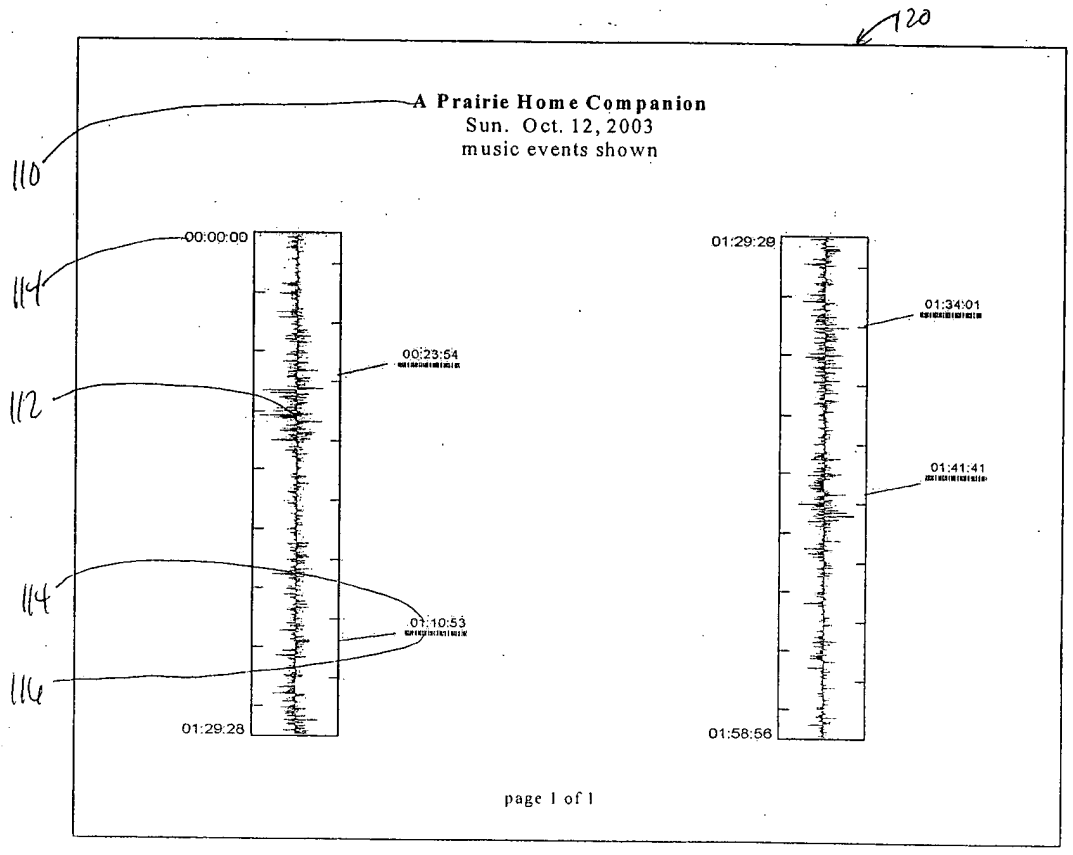


FIG. 12b